Video-feedback interventions for individuals with congenital deafblindness

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Published in:
Journal of Deafblind Studies on Communication

DOI:
10.21827/jdbsc.6.36191

Publication date:
2020

journal of deafblind studies on communication

Vol. 6, 2020, pp. 5-44
University of Groningen Press
10.21827/jdbsc.6.36191

Video-feedback Interventions for Improving Interactions with Individuals with Congenital Deaf blindness: a Systematic Review

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Abstract

Video-feedback interventions have been demonstrated to improve communication between typically developing children and their communication partners. Video-feedback approaches are also applied in interventions that aim to improve interactions and communication of people with congenital deafblindness. However, an analysis of the various applications and effectiveness of video-feedback approaches for this target group is required to guide future practice and research. This study reports on a systematic review of studies on video-feedback interventions aimed at improving social interactions with people with congenital deafblindness. The literature was analysed in terms of intervention landscape and procedure, research methodology and outcome. Results show that a variety of video-feedback interventions are being used with all age groups of people with congenital deafblindness in varied settings and with varied communication partners. The data reveal positive outcomes including increased affective involvement, more sustained interaction and shared understanding. Issues including sustainability of approaches and their effects were identified, as well as lack of detail on the video-feedback sessions. While the review revealed positive outcomes, the lack of explicit information on the video-feedback sessions and the co-occurrence of video-feedback with other interventions make it difficult to determine what factors contributed to the positive outcomes. Recommendations are made for future practice and research.

Keywords

Congenital deafblindness, communication, video-feedback interventions

Introduction

In recent years several studies have been published on Video-Feedback interventions that were specifically designed to improve interactions between individuals with congenital deafblindness (CDB) and their communication partners (Janssen & Damen, 2018). Video-Feedback (VF) interventions are pedagogical programs in which communication partners evaluate their participation in interactions with a child, student or care-recipient, by viewing these interactions on video. The evaluation of their participation in the video recorded interactions with the support of a professional coach or guide, enables the communication partner to gain insight into the effect of their interaction behaviors and to learn to attune these behaviors to the needs of the other (see Fukkink, 2008).

Communication interventions, such as VF interventions, are relevant for communication partners of individuals with CDB because of the frequently reported communication and language delays in individuals with CDB (Bruce, 2005) and low quality interactions (Damen, Janssen, Ruijssenaars, Schuengel, 2015a; Prain, McVilly, Ramcharan, Currie, & Reece, 2010). A factor contributing to the low quality in interactions is that communication partners have problems attuning their communication strategies to the needs of people with CDB (see Janssen, Riksen-Walraven, & Van Dijk, 2003; Vervloed, van Dijk, Knoors, & van Dijk, 2006). Parents and caregivers for example miss communicative attempts of the child, do not provide sufficient processing time, or respond in a way that is not perceivable to the child (Janssen & Damen, 2018).

Commonly used VF interventions for typically developing children, such as Video-HomeTraining and Video-Interaction Guidance are based on theories about early communication development, especially Trevarthen's theory on intersubjective development (see Braten & Trevarthen, 2007). This theory describes three layers in the development of intersubjectivity, defined as "the ability to share subjective states" in children as a result of their interaction experiences. The first layer of intersubjectivity is seen in infants and characterized by other awareness, that is stimulated by parents' sensitive responsive behaviors towards the behaviors and affective states of the child. At the second layer, the child develops mutual awareness while experiencing shared attention for objects and other people and the ability to ask for something or someone. At the third layer, the awareness of a verbal and narrative self and others is developed and seen when the child starts to use more symbolic communication and learns to communicate about his thoughts.

In meta-analyses of VF interventions, their effectiveness in developing improved interaction skills was demonstrated for families with young children (Fukkink, 2008),

and interactions between children with various pedagogical professionals (Fukkink, Trienekens, & Kramer, 2011).

In determining the factors that make VF interventions effective, Wels (2001) indicates that modelling and positive reinforcement of sensitive responsive behaviors by the coach during the video-feedback sessions, are important working principles. The coach models sensitive responsive behaviors during their interactions with the communication partner. The coach also reinforces the sensitive responsive behaviors of the communication partner by purposefully selecting footage of succesful interaction moments for the evaluation with the communication partner (Wels, 2001; Wels & Oortwijn, 1992).

The specific focus in VF interventions on the attunement processes in communication between people makes VF interventions, in theory, suitable for the development of communication partners of individuals with CDB. The question is, however, whether VF programs that are developed for typically developing children are also effective for individuals with CDB. Typical communication behaviors that are observed during these VF programs, such as verbal initiatives or visual attention, will often not correspond with the atypical communicative behaviors of individuals with CDB. Furthermore, the communicative behaviors by the coach during his interactions with the communication partners, such as nodding or saying "yes", may not be usable as a sufficient model of effective communication strategies that will suport interactions with a person with CDB. Therefore, it can be expected that adaptations are needed to make VF usable and effective for communication partners of individuals with CDB.

There is currently no comprehensive overview of the applications of VF interventions and their effects for the population with CDB. Insight into how VF programs can effectively meet the specific needs of communication partners of individuals with CDB is needed by practitioners who aim to support such partners. These insights are also needed by researchers who are interested in the efficacy of VF principles in diverse contexts or, more specifically, in the context of dual sensory disabilities and complex communication needs.

The aim of this study was to obtain an overview of the scientific literature on VF interventions for communication partners of individuals with CDB concerning the intervention landscape (population and context), type of VF interventions and theoretical foundations, intervention aims and process, research methods and outcomes. The following three research questions were formulated: 1) how is Video-feedback (VF) used with communication partners of people with CDB and what is the theoretical foundation of, or rationale for this application?, 2) how are effects of VF interventions measured with this target group? and 3) what are the effects of VF interventions with this target group?

Method

A systematic literature rview was conducted. A flow diagram is presented in figure 1 to make the separate steps visible in accordance with the guidelines in the PRISMA statement (Moher, Liberati, Tetzlaff, & Altman, 2009). Initial searches in ERIC and PsychINFO databases were conducted. This was followed by an advanced search using the following string of search terms:
((deaf AND blind) OR deafblind OR "deaf-blind*" OR "Dual sensory loss" OR (visual impair*" AND "auditory impair*") OR ("visual disabilit*" AND "auditory disabilit*") OR ("vision loss" AND "hearing loss")) AND (communication OR interaction)*.

The search resulted in the identification of 928 articles in total. After removing duplicates, 851 articles remained. Five inclusion criteria were applied to the titles and abstracts of these articles: a) published in an academic peer reviewed journal, b) written in English, c) presenting results of one or more empirical studies, d) focusing on interaction or communication between people with congenital deafblindness and their communication partners, and e) reporting on the application of an intervention for communication partners (such as parents, teachers, caregivers or peers) in which video-feedback is used. No criteria for date of publication were applied. Application of the inclusion criteria to the title and abstracts led to the exclusion of 812 articles. The application of the inclusion criteria of the remaining 39 full-text articles, let to the exclusion of 23 articles and the inclusion of 16 articles for the analysis.

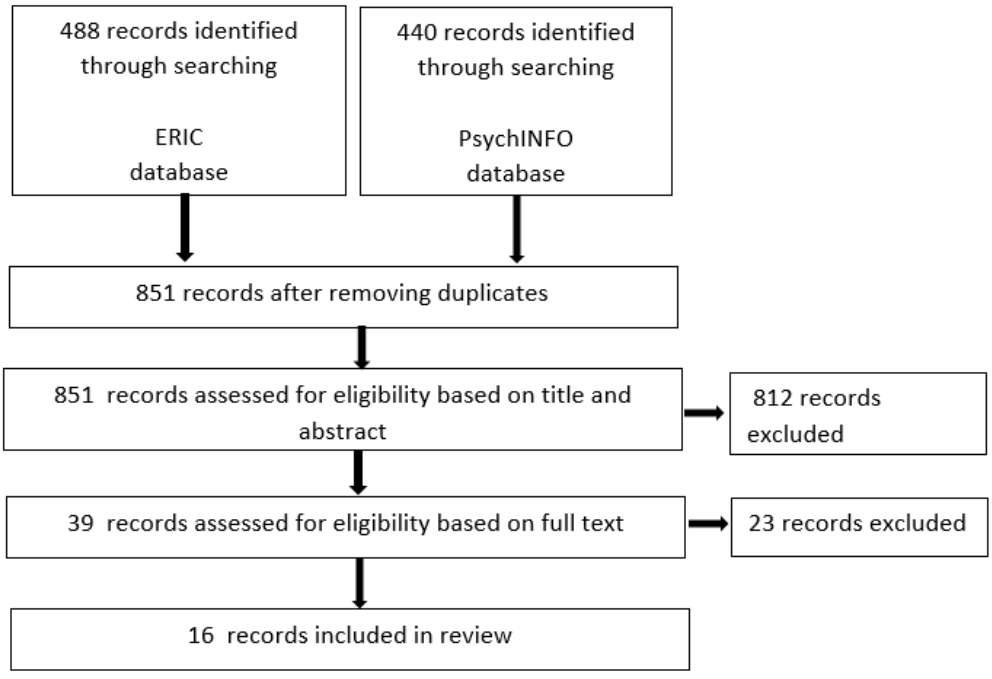

Figure 1. Flow of information during the different phases of our systematic review

The first selection of articles was performed by the first author together with a research assistant. The final decision on the inclusion of the 16 included articles was made by all authors. The authors analyzed the literature qualitatively (see Cozby & Bates, 2015) according to the principles of narrative synthesis in systematic literature reviews and the three analysis steps proposed by Petticrew and Roberts (2006). First, the selected studies were organized and summarized. Then, a within-study analysis was performed to develop a narrative description of the findings of each study. These findings were summarized in Tables 1 and 2 Finally, a cross-study synthesis was conducted to generate an overview of the VF interventions addressed in the different studies. In line with our research questions, we examined the content of the VF interventions and evaluated the research designs and methods used. The selected articles did not lend themselves to a meta-analysis because the studies were statistically too weak and the sample sizes were too small to opt for a quantitative analysis (Cozby & Bates, 2015).

Results

The following is a summary of the results found from the process of analysing the articles in terms of intervention landscape (population and context), intervention processes, research methods and outcomes. See Tables 1 and 2 for a summary of all data. Most of the 16 studies reviewed were conducted in the Netherlands ($n = 15$). One study was conducted in the US, and most articles ($n = 9$) were published within the last 5 years. The oldest article was published in 2002.

Intervention landscape

VF Interventions were used for all age groups. In five studies VF interventions were specifically used with children with CDB. In one study the intervention was used with children with congenital or acquired deafblindness. Four studies report on the use of VF interventions with adults, and the remaining six on the use of VF interventions with both children and adults. The interventions were carried out in various settings: at home, at school, at group homes and day centers. Table 1 provides an overview of the characteristics of these VF interventions.

Video-feedback interventions

Interventions. The 16 articles included in the review report on six different interventions used for individuals with CDB and their communication partners that include VF: Diagnostic Intervention Model (DIM)/Contact, High Quality

Communication (HQC) intervention, Intervention Model for Affective Involvement (IMAI), Project CHANGE, Arranged Interaction Space, and Need-supportive behavior intervention.

Table 1

Overview of Video-feedback Interventions for individuals with CDB

Intervention	Studies	Participants with CDB	Communi -cation partners	Setting	Aim of the intervention	VF sessions		Other intervention ingredients	Coaches and their background
						Group	Individual		
Project CHANGE	Bloeming - Wolbrink et al. (2015)	Six adults, Age: 37-48	15 caregivers	Group home	Improving interaction and communi-cation.	Once a month during 2,2 yrs. Number of sessions not reported.	Multiple times a week during 2,2 yrs. Number of sessions not reported.	Transition to a new home, interaction with specialized caregivers.	Two educational psychologists and a coordinator followed a 2-day training and follow-up training in video analysis
High quality communication intervention	Damen et al. (2014)	One adolescent, aged 19	Three caregivers	Group home	Stimulating interpersonal communi-cation at three layers of inter-subjective development	Three group sessions	Five individual sessions	VF is embedded in diagnostic intervention process. Information transfer: One 2-hr. course on	The coach (first author) received training in providing video feedback, was an experienced consultant on deafblindness and was an expert in the DIM/Contact Program of Janssen.

Intervention	Studies	Participants with CDB	Communi-cation partners	Setting	Aim of the intervention	VF sessions		Other intervention ingredients	Coaches and their background
Needs-supportive behavior intervention	Haakma et al. (2017)	Seven students with CDB or ADB, aged 12, 15, 13, 17, 15, 14, 15.	seven teachers	Primary and secondary special school	Increasing student motivation and engagement by enhancing teachers' need-supportive behaviour.		One individual session		Background coach not reported.
Diagnostic Intervention Model (DIM)/ Contact	M. J. Janssen et al. (2002)	Four children aged 6, 7, 9, 6.	14 educators: three teachers, two classroom assistants, nine caregivers	School and group home	Improving the quality of the interactions between deafblind children and their educators	3 group sessions	2 individual sessions for each educator per child per week	VF is embedded in a diagnostic intervention framework. Modelling and coaching on the job were used in addition to VF.	Coaches were supervised by two supervisors, one is the first author.

Intervention	Studies	Participants with CDB	Communi-cation partners	Setting	Aim of the intervention	VF sessions	Other intervention ingredients	Coaches and their background
	M. J. Janssen et al. (2003)	6 children with CDB between 3 and 19	14 educators (teachers, caregivers, mothers).	Group home, at home, at school		The number of coaching sessions varied across cases		Three coaches. All coaches had extensive experience in supporting educators of children who are deafblind and were trained in and acquainted with the intervention protocol and the observation categories.
	M. J. Janssen et al. (2004)	4 deafblind children aged 7-11	24 educators			3 session of 30 min per child	3x 20 min	Supervisor of coaches is the first author

Intervention	Studies	Participants with CDB	Communi-cation partners	Setting	Aim of the intervention	VF sessions		Other intervention ingredients	Coaches and their background
	M. J. Janssen et al. (2006).	One child, aged 10	one teacher, six caregivers	School, group Home		3 sessions	8 sessions		The coaches received specialized training for 1.5 years by a certified trainer. The trainer is experienced in the education of students who are deaf-blind and is educated by an association that specializes in video interaction guidance (associative intensive training in home situations, or AIT).

Intervention	Studies	Participants with CDB	Communi-cation partners	Setting	Aim of the intervention	VF sessions		Other intervention ingredients	Coaches and their background
	M. J. Janssen et al. (2007)	One child aged 16 (case 1), One adolescent (case 2), aged 19.	Nine caregivers, one teacher	Group home and school		Three sessions of 60 min for both cases.	Case 1: three individual sessions of 60 min with personal caregiver. Case 2: two sessions for the teacher and personal caregiver.		Two coaches.
	M. J. Janssen et al. (2011)	One child, aged 5	One caregiver	Group-home		One team session	Five 45-60 min sessions		One coach with extensive experience in supporting educators of children with deaf-blindness.

Intervention	Studies	Participants with CDB	Communi-cation partners	Setting	Aim of the intervention	VF sessions		Other intervention ingredients	Coaches and their background
	M. J. Janssen et al. (2012)	Five children and one adolescents with congenital deaf-blindness, aged 3,3,5,16 and 19.	13 educators (two mothers, one teacher, and ten caregivers),	Home, group home and at school.		The number of team coaching sessions was limited for organizational reasons.	The number of coaching sessions varied across the cases.		Three interaction coaches. The coaches had completed a basic interaction course and a training from the first author in the terminology of the interaction categories and in the DIM intervention protocol.

Intervention	Studies	Participants with CDB	Communi-cation partners	Setting	Aim of the intervention	VF sessions		Other intervention ingredients	Coaches and their background
IMAI-based intervention	Martens et al. (2014a)	One adult, aged 22	group home: (12 females ranging in age from 21 to 55, M = 31) Daytime activities center: (five females ranging in age from 23 to 54, M = 38.6)	Group home/day time activity centre	Fostering affective involvement	Four sessions of 120 min	Six sessions of 60 min	Diagnostic Intervention Model, 5 steps of intervention protocol Information transfer, coaching on the job, modelling and role playing was provided in addition to VF	The intervention was carried out by a coach (the first author) who is a certified video feedback trainer and has an MSc in educational sciences with a specialization in communication and CDB. At the time of the study, the coach had been working with persons with CDB and supporting their parents and caregivers for more than 10 years.

Intervention	Studies	Participants with CDB	Communi-cation partners	Setting	Aim of the intervention	VF sessions		Other intervention ingredients	Coaches and their background
	Martens et al. (2014b)	Four individuals between 15 and 54 years old	16 communi cation partners	School, day time activity centre, group home		Two sessions of 120 min	Three sessions of 60-minutes		Three coaches. The coaches were familiar with the aim, principles, and protocol of the IMAI, and they were skilled in conducting video analysis and coaching with video feedback. They had extensive work experience and were specialized in interaction and communication with persons who are congenitally deafblind

Intervention	Studies	Participants with CDB	Communi-cation partners	Setting	Aim of the intervention	VF sessions		Other intervention ingredients	Coaches and their background
	Martens et al. (2017)	Four participants aged 20-54	13 communi cation partners	Group home and day time activity center	Fostering Emotion Expression and Affective Involvement	Four sessions of 120 min	Six sessions of 60 min		Four coaches who were familiar with the aim, intervention principles and intervention protocol of the IMAI. Each coach had 10 to 25 years' experience working with people with CDB and/or intellectual disabilities and coaching communication partners
Arranged interaction situation	Bruce et al. (2016)	Six students (3 adolescent students and 3 elementary school–aged students)	Two teachers	School	Fostering self-determinatio n of adolescent students and their interactions with younger peers	Six sessions	/	Arranging interaction situations between younger and older students with CDB, for example by using specific play-materials	Coaches were teachers.

Theoretical Foundations. The theoretical foundation of the interventions shows much consistency with some slight variations. All authors refer to research on communication of individuals with CDB and best practices that reflect an interaction perspective or a social learning perspective on communication. The rationale behind the interventions is that communication partners can stimulate the communication of individuals with CDB and that they need to adapt their strategies or the communication environment to the needs of the individual. The majority of the studies (*n*= 12) also refer to theories on early social and communicative development, including Trevarthen's theory on intersubjective development and Stern's theory on affective involvement. In two studies, authors state their intervention is based on self-determination theories.

Intervention Aims. Concerning the aims of the interventions, four interventions (DIM/Contact, IMAI, HQC and CHANGE) focus on improving the interaction processes, such as enhancing the active participation of the individual with CDB, improving the confirmation of the initiatives of the individual with CDB by the communication partner or enhancing the sharing of emotions between the partners. Two of these interventions, HQC intervention and project CHANGE, also aim to develop more advanced forms of interpersonal communication by the individual with CDB, for example by focusing on an enhanced use of communication to share thoughts (see Damen et al., 2014; Damen et al., 2015a; Damen et al., 2015b; Damen et al., 2017) or the use of communication with the aim to provide or seek information (see Bloeming-Wolbrink, Janssen, Ruijssenaars, Menke, & Riksen-Walraven, 2015).
The Need-supportive behavior intervention and the Arranged Interaction Space focus on achieving specific psychological or social outcomes. The Need-supportive behavior intervention focuses on improving the motivation of students with congenital and acquired deafblindness. While the Arranged Interaction Space focuses on achieving emotional regulation and social skills in adolescent students with CDB.

Intervention process. Individual, or group coaching sessions, or combinations of both were used in the studies. In four of the described interventions, these two types were combined or combined for most of the participating communication partners. The number of VF coaching sessions varied, ranging from just one VF session through to multiple weekly VF sessions for caregivers of adults with CDB during 2,2 years.

The included studies report on various observation categories, evaluated during the VF sessions. Most evaluations concerned aspects of the interaction processes, in line with the earlier mentioned aims of the studies. The evaluation points of the Needs-supportive behavior intervention however, concerned the teacher support that was provided to the child with CDB with respect to three fundamental psychological needs: autonomy, competence and relatedness (see Haakma et al., 2017).

Examples of observation categories, were provided in several of the other included articles. These examples show there were large variations in the way individuals with CDB participated in meaningful interactions and in the way the communication partners supported these interactions.

In all of the six VF interventions that were applied for communication partners of individuals with CDB, VF sessions are combined with other interventions. These additional interventions included information transfer, planned interaction sessions, adaptation of the interaction environments, coaching on the job, practice assignments, role playing, and modelling. The description of the interventions make clear that these were meant to support the communication partners in adapting their strategies or the communication environment for the individual with CDB.

In the three VF interventions DIM/Contact, HQC intervention and IMAI, the VF sessions are provided within a diagnostic intervention framework according to a stepwise protocol. The protocols used in the HQC intervention and IMAI are both based on that of the DIM/Contact intervention (see M. J. Janssen et al., 2003). The first step of the protocol is the determination of the questions communication partners have about their interaction with the individual with CDB. Subsequently the coach clarifies these questions by analyzing the meaningful interactions between each interaction partner with the individual with CDB and the gathering of relevant diagnostic information about the individual, such as his vision, hearing and communication abilities. Before starting with the VF sessions, the coach supports the communication partners to formulate the targets they want to achieve with the intervention. After each VF session, the communication partners decide which communication behaviors they want to foster. The last step is the evaluation of the results of the intervention by the coach and the communication partners in which they reflect on the original questions of the communication partners.

In most of the included articles, no information is provided on the selection of video-clips for the VF sessions and sparse information is given on the role of the coach during the VF sessions. This makes it unclear if these sessions specifically focused on positive interaction and communication examples on the video and if the coach stimulate self-evaluation and uses modelling and positive reinforcement techniques. In the article of Damen et al. (2014) the role of the coach can be inferred from the tasks of the coach, such as supporting the communication partners to formulate targets to work on and the stimulation of their evaluation of the video's in relation to their questions and intervention targets. Also Bruce et al. (2016) provide information about the tasks of the participants and the coaches during the VF sessions, that reveal that self-evaluation was stimulated.

The professional background of the coach and their training in VF coaching was not always clear. The information that is provided shows that there were differences between the coaches in the studies. The coaches in the study of Bruce et al. (2016) were all teachers. In the study of Bloeming-Wolbrink et al. (2015) the coaches were educational psychologists who had received a four-day training on communication and interaction and a two-day training in video-analysis. Damen et al. (2014) and Martens et al. (2014a) mention that the coach in their studies had a Master degree in educational sciences and had received training in VF coaching. In a study of M. J. Janssen, Riksen-Walraven, and van Dijk (2006)it was stated that coaches had received substantial training in communication and interaction with individuals with deafblindness and in VF coaching and had various professional backgrounds, such as speech therapy or teaching.

Research Methods. Most of the studies (n = 12) measured effects in multiple-case experiments. With eight case-experiments on the DIM/Contact intervention, this appeared to be the most frequently studied VF intervention for individuals with CDB.

Three studies report on a single-case experiment. One study involved qualitative action research (Bruce et al., 2016) and one study did not measure the effect of the intervention but the working principle behind the intervention. In this study the presumed working mechanism of 'communication scaffolding', was tested by analyzing communicative sequences that involved the communicative behavior of the communication partners and subsequent communicative behavior of the individual with CDB to see if there was a significant association between these behaviors (see Damen et al., 2017).

The 15 studies in which single or multiple case-experiments were carried out, all used video-observations in naturalistic interaction situations. In several of the case-experiments additional instruments were used to measure the effects of the intervention.

In all the included studies, the interaction situations were repeatedly recorded on video to measure the result of the intervention. However, information about the person who performed the video-recording and the camera-equipment or editing software was not provided. In 15 studies, video-recordings were made during a baseline and intervention period. Ten studies also used follow-up measures.

Table 2

Characteristics of studies on video-feedback interventions for individuals with CDB

Intervention	Studies	Design	Instruments	Coding system /observation categories	Observers	Inter-rater-reliability	Outcome
Project CHANGE	Bloeming-Wolbrink et al. (2015)	T0: 13-month baseline T1 and T2 were 6-month periods starting 3 and 20 months after the start of the intervention	Video observation, Communication Matrix.	5 min video fragments selected; 10 sec interval coded. Interval coding of four observation categories: Attention by the caregiver, Attention by the participant, Confirmation by the caregiver, Affective involvement.	Three trained observers, who were bachelor's students in special needs education.	Interrater reliability was calculated with Cohen's Kappa: .85 for affective involvement, .85 for attention by caregiver, .83 for confirmation by caregiver, and .81 for attention by participant.	Attention provided by caregivers improved for five participants with CDB and decreased in one participant. Attention by the participant with CDB increased for three participant and decreased for the other three participants. Confirmation by caregiver increased for three participants at T1 and further increased for one participant. Affective involvement increased for two participants. Higher levels of communication were observed for all participants with CDB for at least one communicative function at T2. Variety in communication skills improved for all participants.

Intervention	Studies	Design	Instruments	Coding system /observation categories	Observers	Inter-rater-reliability	Outcome
High quality communication intervention	Damen et al. (2014)	Single-case experiment with successive-treatment design. Baseline phase, two intervention phases.	15 video observations,	The coding was carried out via transcript review and additional viewing of the videotaped interactions. Continuous coding of seven observation categories: Dyadic interaction. Shared emotion, Referential communication, Meaning negotiation, Shared meaning, Declarative communication, Past shared experience	Two observers 80% by first observer, 20% by second observer.	The percentage agreement between observers varied between .87 and 1.	Effects were observed in all observation categories from the baseline to the intervention phases.

Intervention	Studies	Design	Instruments	Coding system /observation categories	Observers	Inter-rater-reliability	Outcome
	Damen et al. (2015b)	Multiple baseline across subjects design. Observations during baseline, intervention and follow-up.	162 video observations were carried out with a mean duration of 17.8 min (SD = 4.47).	Coding based on transcripts. Transcripts were made by nine observers. Continuous coding of seven observation categories: Dyadic interaction. Shared emotion, Referential communication, Meaning negotiation, Shared meaning, Declarative communication, Past shared experience	Nine observers who received a transcription manual and a mean of 6 hr. training in transcribing interaction from video recordings	The percentage agreement between observers ranged from 80% to 100% All transcripts were coded by the first coder, after establishing at least 80% inter-observer reliability with the second coder (first author). The second coder also double coded 20% of the transcripts as a reliability check. Two variables were added after coding, so not part of reliability check.	For the seven categories of intersubjective behavior that were measured in this study, a medium to large positive intervention effect was seen in three out of four cases for which this was a specific intervention target (range 1–5; SD = 1.21).

Intervention	Studies	Design	Instruments	Coding system /observation categories	Observers	Inter-rater-reliability	Outcome
	Damen et al. (2017)	Sequential analysis of communication patterns of nine dyads;	73 Video observations	Observations were continuously coded using five observation categories: Non communicative act, Non referential communication, Referential communication, Meaning negotiating, Shared meaning, Declarative Communication. For each observation, the first 10 minutes was used to analyze the two- event sequences of social partner behavior and subsequent behavior of the participant	Two observers One observer coded all the transcribed observations during an additional viewing of the videotapes, after receiving a rating of interrater reliability with a second observer (the first author) of at least 80% for each category during a training period. The second observer also independently double- coded 20% of the material as a reliability check.	Kappa: between 0.71and 1.	Analysis of two-event sequences of communicative behaviors showed a highly significant correspondence between the behavior of the social partner and the subsequent behavior of the individual with CDB, confirming that social partners can scaffold higher-complex communication within interpersonal communication.

Intervention	Studies	Design	Instruments	Coding system /observation categories	Observers	Inter-rater-reliability	Outcome
Needs-supportive behavior intervention	Haakma et al. (2017)	Multiple case-study approach with a pre-test, post-test and follow-up design. The study design consisted of eight phases: pre-test phase 1 and 2 (2 weeks); intervention phase 1 and 2 (2 sessions during 2 weeks); post-test phase 1 and 2 (2 weeks); follow-up phase (1 week); and intervention phase 3 (1 session).	Video observations, Self-report questionnaire	The coding of video's was performed with the aid of a transcript of video. Continuous coding was performed for four observation categories: Autonomy support, Structure, Involvement, Students' engagement	Seven trained observers coded the videos. They had followed a standardized training procedure in order to fully understand all categories of the coding form	The percentage of intra-observer agreement was 98.5% the first time and 100% the second time. Kappa: between .60 and .90.	The results showed that teachers provided involvement most, followed by structure and autonomy support. Teachers' provision of structure and autonomy seems to improve most after the intervention. In general, teachers of students with congenital deafblindness showed larger intervention effects than teachers of students with acquired deafblindness. The results also provide indications that students' levels of engagement improved after the intervention.

Intervention	Studies	Design	Instruments	Coding system /observation categories	Observers	Inter-rater-reliability	Outcome
Diagnostic Intervention Model (DIM)/ Contact	M. J. Janssen et al. (2002)	Multiple baseline design across subjects. Observations during baseline and intervention phase.	Motivation Assessment Scale. Videotaped observations. Social validity scale	During observation of videotapes, occurrence of each target behavior was sequentially recorded using the keyboard of a computer, with the observational software program Continuous coding of four categories: 2 for children, 2 for educators: Appropriate interactive behaviors, Inappropriate interactive behaviors	Three observers	Interobserver agreement ranged from 82.9 to 100% across the various situations, with a mean agreement of 92.2 and 92.5% for the child interactive behaviors and educator responses, respectively.	In three of the four children both an increase in appropriate interactive behaviors and a decrease in inappropriate interactive behaviors were observed. The intervention also proved to be effective fo different educators and acros various situations.

Intervention	Studies	Design	Instruments	Coding system /observation categories	Observers	Inter-rater-reliability	Outcome
	M. J. Janssen et al. (2003)	Multiple single-case experiments. Single baseline observation and a single observation after the intervention was conducted for each interaction partner	Video observation.	For each observation, a five-minute episode of interaction was recorded on videotape. The observations and scoring were done by the first author and two research assistants. Coding based on transcripts. Transcripts were made by nine observers. Continuous coding of eight observation categories: initiatives, answers, confirmation, turns, attention, regulation of intensity, shared emotions, and independent acting.	Three observers	Interobserver reliability was computed for 25% of the videotaped episodes and round to range from 75% to I 00% in the various situations,	For the educators significant intervention effects were found for decrease in number of initiatives and improved regulation of intensity of the interaction. For the children significant intervention effects were found for the most target behaviors such as initiatives, answers, turn-giving, and intensity regulation. Also for the dyadic target behaviors significant effects were found for affective involvement and simultaneous turns.

Intervention	Studies	Design	Instruments	Coding system /observation categories	Observers	Inter-rater-reliability	Outcome
	M. J. Janssen et al. (2004)	Multiple baseline design across subjects. Observations during baseline, intervention and follow-up phase.	Video observations. Motivation Assessment Scale	Video fragments were scored using an observation form specifically designed for the present study. Occurrence and, in the case of independent behaviors, the duration of the behaviors were recorded. Continuous coding was used for interaction categories for children and educators. Observation categories for children: Appropriate interactive child behaviors, Independent child behaviors, Inappropriate child behaviors Observation categories for educators: Adequate responses, Inadequate responses	Two observers	Interobserver agreement was found to range from 73 to 100% across children, with a mean of 87.3% for appropriate interactive child behaviors, 91.3% for independent child behaviors, 93.5% for inappropriate child behaviors, 86.9% for adequate educator responses, and 97.4% for inadequate educator responses.	Intervention effects were observed for the four children. Both the percentage appropriate interactive child behaviors and the percentage independent child behaviors increased by 29.3% and 38.1%, respectively, across the children and remained well above the baseline level during follow-up.

Intervention	Studies	Design	Instruments	Coding system /observation categories	Observers	Inter-rater-reliability	Outcome
	M. J. Janssen et al. (2006)	Single-case experiment. Observations during baseline, intervention and follow-up phase.	Video observations/ five-step intervention protocol	For each observation, a five-minute episode of interaction was recorded on videotape. The observations and scoring were carried out by the first author and two research assistants. Continuous coding Observation categories: Initiatives, Confirmation, Answers, Turns, Attention, Regulation, Affective involvement, Independent acting	Three observers	Interobserver reliability was computed for 25% of the videotaped episodes and was found to range from 86% to 100% in the two situations, with a grand mean of 92.6% across all the categories, with the exception of affective involvement.	Positive intervention effects were attained, and these positive effects were maintained for all but one of the target behaviors across a follow-up period of eight months. Furthermore, the intervention gains even increased during the follow-up for some of the target behaviors, such as affective involvement.

Intervention	Studies	Design	Instruments	Coding system /observation categories	Observers	Inter-rater-reliability	Outcome
	M. J. Janssen et al. (2007)	Multiple single-case experiments. Observations during baseline and intervention phase.	Video-observations/ five-step intervention protocol	For each observation, a five-minute episode of interaction was recorded on videotape. The frequency and duration (time in seconds) of the various kinds of target behavior were registered using an observation form that was specifically designed for this purpose. Continuous coding was used of the following observation categories: Initiatives, Confirmation, Answers, Turns, Attention, Regulation, Affective involvement, Independent acting	Three observers	Interobserver reliability was computed for 25% of the videotaped episodes in both cases. The average reliability percentages were 97.8% for Nicole's educators (ranging from 94% to 100% for the different categories), 91.2% for Nicole (ranging from 80% to 100%), 96.2% for Anton's educators (ranging from 87% to 100%), and 97.3% for Anton (ranging from 93% to 100%). For Nicole, observer reliability could not be calculated for the category regulation of intensity by the educators because of the poor quality of some of the videotapes.	The intervention was successful in the two individuals with CDB. Team coaching alone was effective in one case, but not in the other. In this latter case, individual coaching appeared to be necessary to make the intervention effective.

Intervention	Studies	Design	Instruments	Coding system /observation categories	Observers	Inter-rater-reliability	Outcome
	M. J. Janssen et al. (2011)	single-case experiment	Video observations/ five step intervention protocol/ An adapted version of the Social Validity Scale	For each observation, the first five minutes of the videotape were selected. The frequency and duration of the various target behaviors were registered by two independent observers using an observation form that was specifically designed for this purpose. Continuous coding was used of Eight observation categories: Initiatives, Confirmation, Answers, Turn taking, Turn giving, Intensity, Simultaneous turns, Affective involvement	Two observers	The average interobserver reliability for the various categories of interaction ranged between 81% to 90% (sd=4,29) for the individual with CDB and between 81% and 99% (sd=8,27) for the caregiver.	Changes in the caregiver's turn-giving had substantial effects on the child's turn-taking, regulation of intensity, and approving and disapproving answers. The interaction effects were less clear for the child's initiatives.

Intervention	Studies	Design	Instruments	Coding system /observation categories	Observers	Inter-rater-reliability	Outcome
	M. J. Janssen et al. (2012)	Multiple single-case experiments. Observations during baseline, intervention and follow-up phase.	Video observations/ five step intervention protocol	All the sequences of sustained interaction between the child and the educator of at least three turns were recorded in terms of the duration in seconds, the duration of the longest sequence, and the mean number of turns in a sequence. Continuous coding of eight observation categories: Initiatives, Confirmation, Answers, Turns, Attention, Intensity, Affective involvement, Independent actions	The number of observers was not reported.	The interrater agreement varied between 90% and 99%.	The DIM had positive effects on sustained interaction across all the cases and communication modalities, except in the calendar situation for one case.

Intervention	Studies	Design	Instruments	Coding system /observation categories	Observers	Inter-rater-reliability	Outcome
Intervention Model for Affective Involvement (IMAI)	Martens et al. (2014a)	Single case-experiment with baseline, two intervention phases and a follow-up phase	Video observations/ adapted version of the Social Validity Scale	Time sampling was used to record the occurrence of five observational categories on a coding form that broke the 11-min sequences into 30-s intervals.	Three observers	Inter-observer agreement ranged from 80% to 100%.	The findings show that the onset of the intervention coincided with improvements in affective involvement and emotional behavior in the participant with CDB.
	Martens et al. (2014b)	Multiple-case experiment with a multiple-baseline design and four phases: baseline, two intervention phases and follow up phase.	Video observations/ adapted version of the Social Validity Scale	Interval coding of five observation categories: Affective involvement, Very negative emotions, Negative emotions, Positive emotions, Very positive emotions.	Three observers	Interobserver agreement ranged from 75% to 100% (SD _ 7.98) across clients, with a mean agreement of 95% across observation categories.	Affective involvement increased for four participants. Very positive emotions improved and (very) negative emotions decreased for all participants During the follow-up the positive effects decreased in most cases..

Intervention	Studies	Design	Instruments	Coding system /observation categories	Observers	Inter-rater-reliability	Outcome
	Martens et al. (2017)	Multiple case-experiment with a multiple-baseline design	Video observations/ adapted version of the Social Validity Scale		Four observers	The mean interobserver agreement for all observation categories was 95%, with a range between 80% and 100% across the clients.	In all cases, dyadic affective involvement increased, the participants' very positive emotions also increased and the participants' negative emotions decreased.
Arranged interaction situation	Bruce et al. (2016)	Qualitative study, collaborative action research	videotaped observations, feedback sessions, evaluation forms, and field notes	Each video was viewed three times, and notes and suggested themes were organized by research questions; grounded theory was used for the analysis. Observation categories were: Joint attention, choices and preferences, Facilitating engagement.	Two observers	Not calculated	Adolescent students with CDB learned to interact more effectively with younger students with CDB. .

The number of observations showed substantial variations between case experiments, sometimes even within one study, with a range of 2-10 observations in each phase. For the analysis of the video-recorded observations, in the majority of the studies (*n*= 15) a coding system was used that was designed by the researchers and often matched the observation categories that were used in the VF sessions. For the coding process, either continuous coding or interval coding was applied in these studies. Studies used fragments of various duration with a range of 5-20 minutes for the coding. In two studies on the HQC intervention, the coding of videos was supported by using a transcript of the communication patterns of the individual with CDB and the communication partner.

Some observation categories that were used for effect measurement were applied by multiple authors. The most commonly used observation categories were *affective involvement* and *confirmation*. All studies used multiple coders. In the study on the Arranged Interaction Space consensus coding was used. In the other 15 studies independent coding was used by the coders for all or for a part of the observations. The mean inter-rater reliability in these studies was high.

Outcomes. Positive results were reported for the majority of the participating individuals with CDB and their communication partners, although there were differences between cases.

Two studies on the Diagnostic Intervention Model (DIM)/ Contact intervention (Janssen et al, 2002, 2004) revealed an increase in the mean percentage appropriate child interaction behaviors and decrease of inappropriate child interaction behaviors in seven out of eight cases. In two multiple case studies with each four individuals with CDB, mean gains of 21.8% and 20.2% were reported in the percentage adequate interaction behaviors of the educators (Janssen et al., 2002; Janssen, Riksen-Walraven, & van Dijk, 2004). In a multiple case-experiment with six children with CDB and their 14 educators, gains of 20% to 1250% were found in the interactive behaviors of both children and educators. For the six children together, significant results were found of the DIM/Contact intervention for six of eight behaviors: initiatives, answers, confirmation, attention, turn giving and independent acting (Janssen et al., 2003).

In a study on the DIM/Contact program in which for some communication partners only team coaching was used (Janssen, Riksen-Walraven, van Dijk, Ruijssenaars, & Vlaskamp, 2007), the mean occurrences of interaction behaviors showed positive changes in all interaction behaviors for one individual with CDB, but not for the other individual. According to the authors, comparison of the results for individual educators in the second case-study revealed that results were much better for the educators who had received a combination of individual and team VF compared with those who only had received team VF. In two other single case studies, positive

intervention effects were found for one child on his initiatives, confirmation and turn taking (M. J. Janssen et al., 2006) and for the other child on his turn giving, intensity and answers (Janssen et al., 2011). In the first case-experiment, the follow-up patterns showed that results were not maintained, whereas in the second case-experiment results were maintained or increased in the follow-up phase.

In a multiple-case study on the DIM/Contact that involved mothers of two toddlers with CDB, positive intervention effects were found for nearly all target categories for both children and their mothers. However, the results were lower in the situations in which the mothers used materials in interaction with the child. In another case-experiment with six children (Janssen et al., 2012) the data patterns revealed effects of the intervention on sustained interaction across all the cases and communication partners, except for the observations of one child during calendar activities.

The studies on IMAI (see Martens et al., 2014a, 2014b; Martens et al., 2017) showed increases in the observed mean occurrence of affective involvement and positive emotions and a decrease in the mean occurrence of negative emotions in all eight case-experiments when data of the first intervention phase were compared with those of the baseline phase. There were differences though between individual cases in the results of the second phase and follow up phase. Follow-up measures were performed for five cases of which three case studies revealed a drop in affective involvement compared with the first or second intervention phase. In three cases, a drop was seen in positive emotions in the follow-up phase, when this phase was compared with one of the two intervention phases.

Differences between individual cases were also found in other studies. The study of Haakma et al. (2017) report that five out of seven teachers improved in their provision of structure and autonomy support to their student with deafblindness after receiving the Needs-supportive behavior intervention. Two students with CDB showed more engagement in the post-test and one in the follow-up test. In the six case-experiments that were conducted on the HQC intervention (Damen et al., 2014; Damen et al., 2015b) significant effects were found for all individuals with CDB for at least one of the communication categories that were associated with the first and second layers of intersubjective development described by Braten and Trevarthen (2007); dyadic interaction, shared emotion, referential communication, meaning negotiation and shared meaning.

In four out of six cases, significant effects were also found for at least one communication aspects of the third layer: declarative communication and the sharing of past experiences. In five out of six case-studies more effects were found during or after the second intervention phase then in the first intervention phase. In the first

phase, communication partners were supported in the attunement of their behaviors and emotions to those of the individual with CDB, whereas in the second phase the support of communication partners focused on the stimulation of meaning making in the interactions with the individuals with CDB (see Damen et al., 2015b).

In the study on the working mechanism of the HQC intervention (Damen et al., 2017), sequential analysis of communication patterns revealed a significant association between the more complex communication behaviors of the communication partners and the subsequent behaviors of the individual with CDB. This led to the conclusion that communication partners can elicit complex communication behaviors in the individual with CDB by scaffolding this communication during the interaction.

An exception to the predominantly positive results of VF interventions described for individuals with CDB, is the study of Bloeming-Wolbrink et al. (2015). While mostly positive outcomes were reported for the participating adults with CDB some interaction behaviors deteriorated, namely attention given by the caregiver for one participant and attention given by the participants for three participants.

Conclusion

This review identified 16 empirical studies using VF approaches with individuals with CDB. Results show that a variety of VF interventions are being used with all age groups of people with CDB in varied settings and with varied communication partners. The overview also showed that usually 2-10 VF sessions are used and that individual VF sessions are often combined with group or team VF sessions. Janssen et al. (2007) found this combination was more effective in communication partners then group VF alone, though further research is needed to verify this finding.

In all studies, VF approaches were always combined with other interventions, such as information transfer, coaching on the job, or modelling. These additional intervention approaches were specifically aimed at supporting the communication partners to adapt their communication strategies to the needs of the individual with CDB. This included several interventions, in which VF sessions were also embedded within a diagnostic intervention model. Such a procedure incorparates elements that are known as general working principles in youth care interventions: goal directedness, methodic approach and client-directedness (Van Yperen, Veerman, & Bijl, 2017). However, the use of multiple intervention approaches used in combination or sequence makes it extremely challenging to determine which interventions, or aspects of the interventions are most effective.

The analysis of VF sessions for individuals with CDB was not always clear. In general, no information was given on the role of the coach and the selection of video

clips for review. It also remains unclear whether differences in the number of sessions and the provision of additional interventions can be explained by the variations in characteristics of individuals with CDB and their communication partners, or by other factors, such as availability and expertise of the coach or the available time of communication partners. This information must be made explicit to both increase replicability of studies, as well as comparability between studies.

The data reveal positive outcomes including increased affective involvement, more sustained interaction and shared understanding. In line with the aims of the interventions that usually focused on the basic aspects of interpersonal communication, most results were achieved on aspects of the first layer of intersubjective development described by Trevarthen. Because of the commonly reported problems with the development of higher layers of intersubjective development (see Damen, et al., 2015), symbolic communication (Bruce, 2005) and language (Dammeyer & Larsen, 2016) in individuals with CDB it is striking that only two VF intervention focused on higher layers of intersubjective development.

Discussion

Almost all of the studies reviewed were performed in the Netherlands by different research teams under supervision of the same researcher. The relatively limited amount of studies found on VF interventions in the literature search is consistent with the general lack of effect studies that are carried out for this target group. This lack of effectstudies may in part be due to the small incidence of CDB and the complexity and heterogeneity of the target group (Dammeyer, 2012; Parker, Davidson, & Banda, 2007).

While VF interventions have proliferated since the 1980s, with an ever increasing body of evidence demonstrating their effectiveness with various populations, the current review highlights a lack of transparency of the intervention process, and lack of research in general on the efficacy of VF interventions with people with CDB. The studies that have been undertaken have typically used quantitative research methods and there is a need for more qualitative data to ascertain perspectives of communication partners on both the processes and outcomes of the processes, as quantitative data alone does not allow for a full understanding of what is occurring.

In order to enhance the replicability of studies on VF interventions in individuals with CDB, researchers need to provide explicit information on: the intervention process (see Van Yperen et al., 2017), training and background of the coach, techniques, strategies, and structure used for coaching, the selection of film clips for coaching purposes, the person who is filming and their relation to participants. International collaboration is also recommended to increase the sample

sizes and to develop shared understandings of intervention and coding methods, particularly outside the Netherlands. The use of similar coding methods and the report of numerical data are needed in order to perform a meta-analysis on the effects of specific VF approaches for communication partners of individuals with CDB in general, or for particular subgroups.

Finally, it is important that VF interventions do not only focus on basic aspects of communication. Like all humans, individuals with CDB need to be supported in the development of advanced ways of communicating including the development of language. Communication and language abilities are fundamental for personal development, social-emotional development and learning in general. Therefore, VF interventions should also focus on stimulating more complex forms of communication and on language development. However, this may require other communication strategies and other ways of supporting the communication partners. Furthermore, to enable lifelong learning, individuals with CDB should be supported longitudinally and VF sessions must be offered to communication partners regularly and not only during an intensive period of training. In order to monitor if VF sessions are needed, careful observation of the development of individuals with CDB and the support needs of their communication partners is required.

Limitations

Limitations of this review are the limited number of studies and the small sample sizes which prevent a generalization of the results. The use of different coding systems and different ways of presenting the data make a comparison of the case-experiments complex. Furthermore, with the exception of three studies Damen et al. (2014); Damen et al. (2015b); Janssen et al. (2003) information was not provided on the actual effect sizes or significance of the difference between phases.

Recommendations

While the studies reviewed report positive effects, more research is needed on VF approaches used with communication partners of individuals with CDB to develop insight into the key components which effect positive communication outcomes, including number of sessions required to achieve a positive change. Researchers need to provide more information regarding details of the interventions including qualifications and experience of the coach, how video clips are selected, and the nature of the coaching sessions for replicability and comparability of studies. Most studies employ quantitative research methods and more qualitative evaluations of VF intervention approaches would also contribute valuable information to the field.

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